Appendix 6

Modeled Attainment Test Using Georgia EPD Ozone Modeling Results

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To provide additional modeling data for use in the attainment test, Georgia and South Carolina have shared ozone modeling results. This section covers the use of the attainment test for South Carolina nonattainment areas using results from Georgia EPD's modeling runs. This work is being included as part of a weight of evidence analysis

Georgia's ozone modeling analysis concerns an episode occurring August 11-20, 2000. Information on episode selection, emissions inventory, and model quality assurance is available in the *Early Action Plan for the Augusta Early Action Compact* prepared by the Georgia Department of Natural Resources, Environmental Protection Division, Air Protection Branch. A copy of this document is located in appendix 17; included in this document is a discussion of whether this episode is representative for the South Carolina EAC areas along with model performance for these areas. The Anderson Greenville Spartanburg EAC areas and the Columbia EAC area are both located in the twelve kilometer grid portion of Georgia's modeling analysis. In Section 13.2 of the draft modeling guidance, there is not a clear requirement to use 4 km grid spacing. As noted in Section 13.2, there have been documented cases of ozone modeling using 12 km grid spacing providing more conservative ozone values than those values provided with 4 km grid spacing. Also in Section 13.2, it is noted "Recent sensitivity tests comparing relative reduction factors in predicted 8-hour daily maxima near 272 sites in the eastern United States indicate generally small unbiased differences ($\leq$ 0.04, in 95% of the comparisons) using a grid with 12 km vs. 4 km grid cells (LADCO (1999))." As such, use of Georgia's ozone modeling analysis with 12 km grid spacing is appropriate.

The draft attainment demonstration procedures for 8-hour ozone differ from those for 1-hour ozone in several ways. A key difference is that the modeled attainment test is based on relative, rather than absolute, use of the modeling results. Thus, the test relies on the ability of the photochemical modeling system to simulate the change in ozone due to emissions reductions, but not necessarily its ability to simulate exact values for future-year ozone concentrations. Another difference is that the 8-hour attainment test is site-specific while the 1-hour test focuses on an urban-scale modeling domain. Yet another difference is that modeling comprises a part of the "weight of evidence" for the 8-hour ozone attainment demonstration—a somewhat lesser role, perhaps, than for 1-hour ozone.

A. Attainment Test

For a monitoring site to pass the attainment test, its future-year estimated design value must not exceed 84 ppb. Future-year estimated design values (EDVs) are calculated for each site, for each simulated day, using "current-year" design values and relative reduction factors (RRFs) derived from future-year and base-year modeling results. The current-year design value for a given site is the three-year average of the annual fourth highest measured 8-hour ozone concentration. The RRF is the ratio of future- to base-year 8-hour maximum ozone concentrations in the vicinity of that monitoring site. The EDV is obtained by multiplying the current-year design value by the RRF.

Attainment Test Application Procedures

For South Carolina, the attainment test procedures outlined in the draft EPA guidance document were adapted for the South Carolina modeling domain and simulation period. Key implementation issues are discussed here.

As described above, relative reduction factors for each site are calculated using simulated ozone concentrations within the "vicinity" of that site. For the 12-km South Carolina subdomain, "vicinity" was defined as within one grid cell of the grid cell in which the monitoring site is located. That is, the nine grid cells surrounding a monitoring site were included in the search for the maximum value. This resulted in a radius of influence of approximately 12 km.

Results from the Attainment Test

Maximum current and estimated design values for the nonattainment sites in South Carolina are given in Table A-1. This table shows the calculations of the relative reduction factors for 2007. For the Anderson/Greenville/Spartanburg nonattainment area, these sites are the Powdersville monitor located in Anderson County and the North Spartanburg Fire Station monitor located in Spartanburg County. For the Columbia nonattainment area this site is the Sandhill monitor located in Richland County. The EDVs were calculated using the 2007 future year baseline as the basis for calculation of the RRF. For all sites, the EDV for 2007 is lower than the 1997-1999 DV. In addition, the values for all sites are less than or equal to 84 ppb. The 2001-2003 design value for these sites is also included in the table; the 2001-2003 design value was the data used to determine South Carolina's 8-hour ozone attainment status.

Table A-1a.
Simulated current and future year 8-hour ozone concentrations for the Powdersville (Anderson County) site for the Anderson/Greenville/Spartanburg area.

Simulation Date	Simulated Maximum 8-Hour Ozone (ppb)	
	1998	2007
8/13/2000	65[1]	56[1]
8/14/2000	80	69
8/15/2000	85	72
8/16/2000	94	79
8/17/2000	97	83
8/18/2000	79	70
8/19/2000	91	77
Average	87	75
EDV Calculations		
RRF		0.86
1999-2001 DV		91
2001-2003 DV		86
EDV (2001)		78

[1] Since the 8/13/2000 maximum ozone concentration is less than 70 ppb, this day's ozone concentrations are not used in the calculation of the RRF.

Table A-1b.
Simulated current and future year 8-hour ozone concentrations for the North Spartanburg Fire Station (Spartanburg County) site for the Anderson/Greenville/Spartanburg area.

Simulation Date	Simulated Maximum 8-Hour Ozone (ppb)	
	1998	2007
8/13/2000	59[1]	50[1]
8/14/2000	71	62
8/15/2000	78	63
8/16/2000	92	78
8/17/2000	85	72
8/18/2000	82	72
8/19/2000	83	71
Average	81	69
EDV Calculations		
RRF		0.85
1999-2001 DV		93
2001-2003 DV		87
EDV (2001)		79

[1] Since the 8/13/2000 maximum ozone concentration is less than 70 ppb, this day's ozone concentrations are not used in the calculation of the RRF.

Table A-1c.
Simulated current and future year 8-hour ozone concentrations for the Sandhill (Richland County) site for the Columbia area.

Simulation Date	Simulated Maximum 8-Hour Ozone (ppb)	
	1998	2007
8/13/2000	59[1]	51[1]
8/14/2000	70	61
8/15/2000	84	74
8/16/2000	100	85
8/17/2000	80	70
8/18/2000	92	80
8/19/2000	75	64
Average	83	72
EDV Calculations		
RRF		0.87
1999-2001 DV		94
2001-2003 DV		88
EDV (2001)		81

[1] Since the 8/13/2000 maximum ozone concentration is less than 70 ppb, this day's ozone concentrations are not used in the calculation of the RRF.

Since attainment is modeled in all three areas, it can be construed that there are few, if any, grid cells that will be above the 8-hour ozone standard in South Carolina in the 2007 ozone modeling analysis. As such, the three recommended metrics on grid cell improvement listed in section 4.1.1 of EPA's draft 8-hour ozone modeling guidance would be met.

B. Summary of Findings from Application of the Attainment Test

Application of the modeled attainment test indicates that:

- The average estimated design value (EDV) for 2007 is approximately 12 ppb lower than the 1997-1999 observation-based design value.
- 2007 EDVs for all sites are less than or equal to 84 ppb.
- The attainment test is passed for all sites for the 2007 scenarios.

This information provides additional weight that South Carolina will attain the 8-hour standard in 2007.

Use of different base- or current-year design values may alter these findings.